

## REMARKS

### In the Claims:

Claims 8-19 are currently pending.

### **CLAIMS REJECTED UNDER 35 U.S.C. § 103(a)**

The Examiner has rejected Claims 8-19 under 35 U.S.C. § 103(a) as being unpatentable over Kovacs (DE 3335962) in view of Takada et al. (JP 61-39416). Applicants respectfully traverse this rejection.

Examiner contends that Kovacs proposes to use a four-cycle engine for a chain saw, Takada discloses a lubrication apparatus, and one of ordinary skill in the art would combine the engine lubrication of Takada with the tool of Kovacs. However, the Examiner has not identified any motivation in Kovacs or Takada for combining these references and then miniaturizing them; has not shown any evidence or suggestion that the miniaturization of Kovacs combined with Takada would result in an operable, handheld, portable power tool; and has not shown how the references could be combined without drastically altering what the references disclose.

Neither Kovacs nor Takada suggest their combination or miniaturization. The Examiner's purported reasoning that miniaturization was not done prior to Applicants' invention because of expense, and not technology, is not supported. There is no showing that the mere miniaturization of either the partial engine of Kovacs or the lubrication system of Takada will necessarily result in a properly working engine for use on a portable, handheld power tool. Without a showing that mere miniaturization would accomplish that which is taught in Claims 8-19 the Examiner's contention simply amounts to speculation. In re Fritch, 972 F.2d 1260, 1265-66 (Fed. Cir. 1992) (stating that the mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious to one skilled in the art unless the prior art suggested the desirability of the modification). There is no teaching as to how the partial four-cycle engine taught in Kovacs or Takada can be miniaturized to provide a reduction in weight and size in order to be used with a hand-held tool. To the contrary, the scientific community recognized that miniaturization alone would not

accomplish what Applicants invented. For example, the 1993 Popular Science article titled *The Little Engine That Could* (attached hereto as Ex. A) states that to characterize Ryobi's four-cycle engine as "just miniaturizing" is "an understatement of the cleverness of the Ryobi engine design." (Ex. A, p. 92).<sup>1</sup> The Examiner's contention that simply miniaturizing the partial four-cycle engine of Kovacs and combining it with the lubrication apparatus of Takada would have been obvious to one skilled in the art is inapposite in view of the findings of this article. The Examiner has not provided a reference to indicate a teaching or motivation that combining Takada and Kovacs would be obvious to one skilled in the art. Further, there is nothing in either Kovacs or Takada that suggests miniaturization of the Takada lubrication system. Such a combination and the further miniaturization of that combination is mere speculation that is made with the benefit of hindsight only, which is improper. In re Fitch, 972 F.2d at 1266 (stating that it is impermissible to use the claimed invention as a template to piece together a teaching from the prior art so that the claimed invention is rendered obvious).

The Examiner also contends that one of ordinary skill in the art would be motivated to combine the lubrication system of Takada with the 4-cycle engine of Kovacs in order to obtain the advantages of Takada. On the contrary, Applicants submit that one of ordinary skill in the art would not be motivated to combine Kovacs and Takada because the combination would result in something that eliminates the required features of one or both of the references. Specifically, Kovacs discloses certain important engine features that are drastically different from those in Takada. For example, Kovacs requires that "the engine is built with an inlet and outlet *in the cylinder head*" (Kovacs, p. 2). Further, Kovacs requires two inlet openings (Kovacs, p. 2), the second being in the cylinder center (Kovacs, p. 2). By comparison, Takada requires that the inlet and outlet valves as well as the mechanism for operating the valves be "provided above the cylinder head" (Takada, p. 2). The structures of Kovacs and Takada do not appear to be compatible and any combination of the two would significantly alter the structure disclosed by each of those references. There can be no

---

<sup>1</sup> This article refers to Ryobi because the parent application was originally assigned to Ryobi. Ryobi has since transferred all of its rights to MTD.

Application No.: 10/666,924  
Response Date: June 13, 2005  
Reply to Office Action Dated April 14, 2005

motivation in a situation such as this. In re Fitch, 972 F.2d at 1265 n. 12 (stating that a proposed modification is inappropriate for an obviousness rejection if the modification would render the prior art reference inoperable for its intended purpose); In re Gordon, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984).

Further, there is no teaching in Takada as to how the disclosed lubrication system is capable of being adapted to be incorporated into different engines, let alone the partial engine disclosed in Kovacs. Without further teaching, it would not be obvious to one skilled in the art to combine the lubrication apparatus of Takada with the four-cycle engine of Kovacs. Therefore, Applicants submit that Claims 8-19 are patentable over the prior art, and that the present apparatus is not an obvious combination of Takada and Kovacs.

In view of the foregoing comments, Applicants respectfully submit that Claims 8-19 are patentable over Kovacs in view of Takada et al., and the claims are in a condition ready for allowance. In the event issues remain that the Examiner feels might be resolved by interview, he is respectfully requested to telephone applicant's attorney at (312) 321-4221.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Robert S. Mallin", is written over a horizontal line.

Robert S. Mallin  
Registration No. 35,596  
Attorney for Applicant

BRINKS HOFER GILSON & LIONE  
P.O. BOX 10395  
CHICAGO, ILLINOIS 60610  
(312) 321-4200

1993 NEW AMERICAN HOME

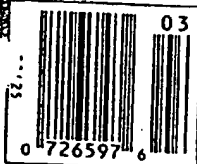
# Popular Science

TINY 4-CYCLE  
OUTDOOR  
POWER

America's  
\$1 billion  
high flying  
4,400 mph  
ramjet

U.S. AIR FORCE

# SPY PLANE



MARCH 1993  
\$2.50  
CANADA

# Popular Science

THE WHAT'S NEW MAGAZINE

MARCH 1993

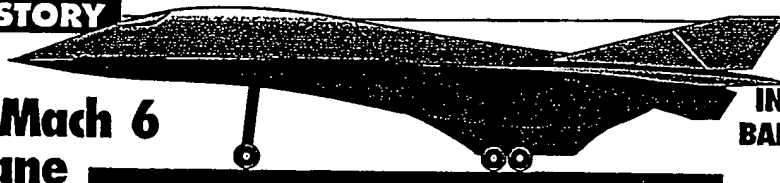
Founded in 1872/Vol. 242, No. 3

## COVER STORY

56

### Secret Mach 6 spy plane

An eyewitness description, a secret Nevada test site, and a new look at advanced aeronautics paint a portrait of Aurora, America's newest secret reconnaissance aircraft. A Federation of American Scientists report also posits the existence of the plane, along with others flying in the Pentagon's "black world."



**SPECIAL REPORT:**  
IN SEARCH OF  
BALANCE ..... 10

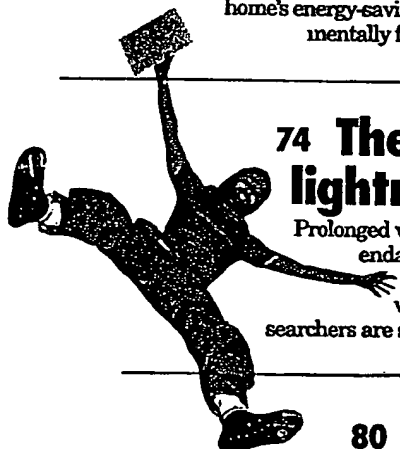
### 66 A house for all reasons

The architectural style may be classic Mediterranean villa, but the 1993 New American Home contains some of the most technologically advanced home-building products available today, complementing the home's energy-saving and environmentally friendly themes.



### 74 The unbearable lightness of space travel

Prolonged weightlessness in near-zero gravity could endanger human health, as well as NASA's plans for long missions. The ill effects include muscle-wasting and heart shrinkage. Here's how researchers are studying the problems—and hope to solve them.



### 80 Minivans to the max

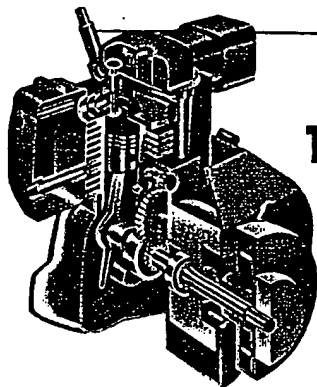
Volkswagen EuroVan, Mercury Villager, Nissan Quest, and Dodge Grand Caravan: One is the tallest, two are the widest, and one is the longest. We tell you which is which and which is the best.



90

### The little engine that could

This one-cylinder four-cycle gas-powered engine is lightweight enough for hand-held outdoor power equipment—and clean enough for stringent emissions standards that are coming soon.



**WHAT'S NEW** ..... 12

#### SCIENCE AND TECHNOLOGY

Science newsfront..... 31  
Buried sunshine heats sports center..... 32  
Out of the black: secret Mach 6 spy plane..... 56  
The unbearable lightness of space travel..... 74  
Mr. Babbage's wonderful calculating machine..... 88

#### COMPUTERS AND ELECTRONICS

Electronics newsfront..... 26

#### CARS AND DRIVING

Automotive newsfront..... 46  
Car test: minivans to the max..... 80

#### HOME PRODUCTS AND TECHNOLOGY

Home newsfront..... 39  
New American Home 1993: a house for all reasons..... 66  
The little engine that could..... 90

#### ADDITIONAL FEATURES

From the editor..... 4  
Readers talk back..... 6  
Product information..... 112  
Looking back..... 120

COVER ILLUSTRATION BY KERRY LESLIE

# THE LITTLE ENGINE THAT COULD

This four-cycle engine is lightweight enough  
for hand-held equipment—and clean  
enough for California.

BY JUDITH ANNE GUNTHER



**H**ere, claimed experts in the outdoor power tool industry, was a problem without a ready solution. How could they build a gas-powered engine small and powerful enough for consumers, yet sufficiently clean-burning to meet increasingly demanding legislation?

Now one manufacturer, Ryobi North America, the South Carolina-based subsidiary of the Japanese tool-maker, says it has an answer. Ryobi's GleanAir engine is a radically scaled-down 26cc four-cycle engine that deftly delivers one horsepower in an eight-pound package. And Ryobi is betting that this engine will heavily influence the hand-held outdoor power tools that consumers buy in the mid-1990s.

For decades, manufacturers have relied on two-cycle engines to power chain saws, trimmers, blowers, and other tools that require light weight and brute force, taking advantage of a power pulse with every crankshaft revolution ("Greener Pastures," July '92). But such performance has its price—air pollution—and in 1990 the California Air Resources Board (CARB) established stringent emissions standards that will have to be met by all gas-powered utility products sold in that state. The CARB regulations, which take effect in two phases, 1994 and then 1999, have been criticized by some manu-

facturers as being too difficult to meet in a relatively short period of time. Discussions are under way between CARB and manufacturers to move the first phase deadline back by one year.

How did Ryobi get the jump on the industry? Partly by making the project a priority item as early as 1989 and partly by pushing the limits of small engine technology. The GleanAir engine circumvents the exhaust emissions problem inherent in two-cycle engines mainly by employing its cousin, the four-cycle engine.

The project had sprung from a concept for a small-displacement, low-cost, four-stroke engine that had been proposed to Ryobi in 1988 by Robert Byerts, an Arizona-based engineer whose company produced the first working prototype. Commonly used in heavier lawn and garden equipment, a four-cycle engine fires its piston on every other revolution and uses conventional poppet valves to control the flow of the incoming fuel-air mixture and outgoing exhaust. This helps reduce the chance that some fuel will escape unburned. And unlike many two-cycle engine designs, the four-cycle does not require that the lubricating oil be mixed directly with the gasoline, a major cause of the blue smoke plume that routinely spits out of two-cycles.

"We started out with three criteria for this engine:

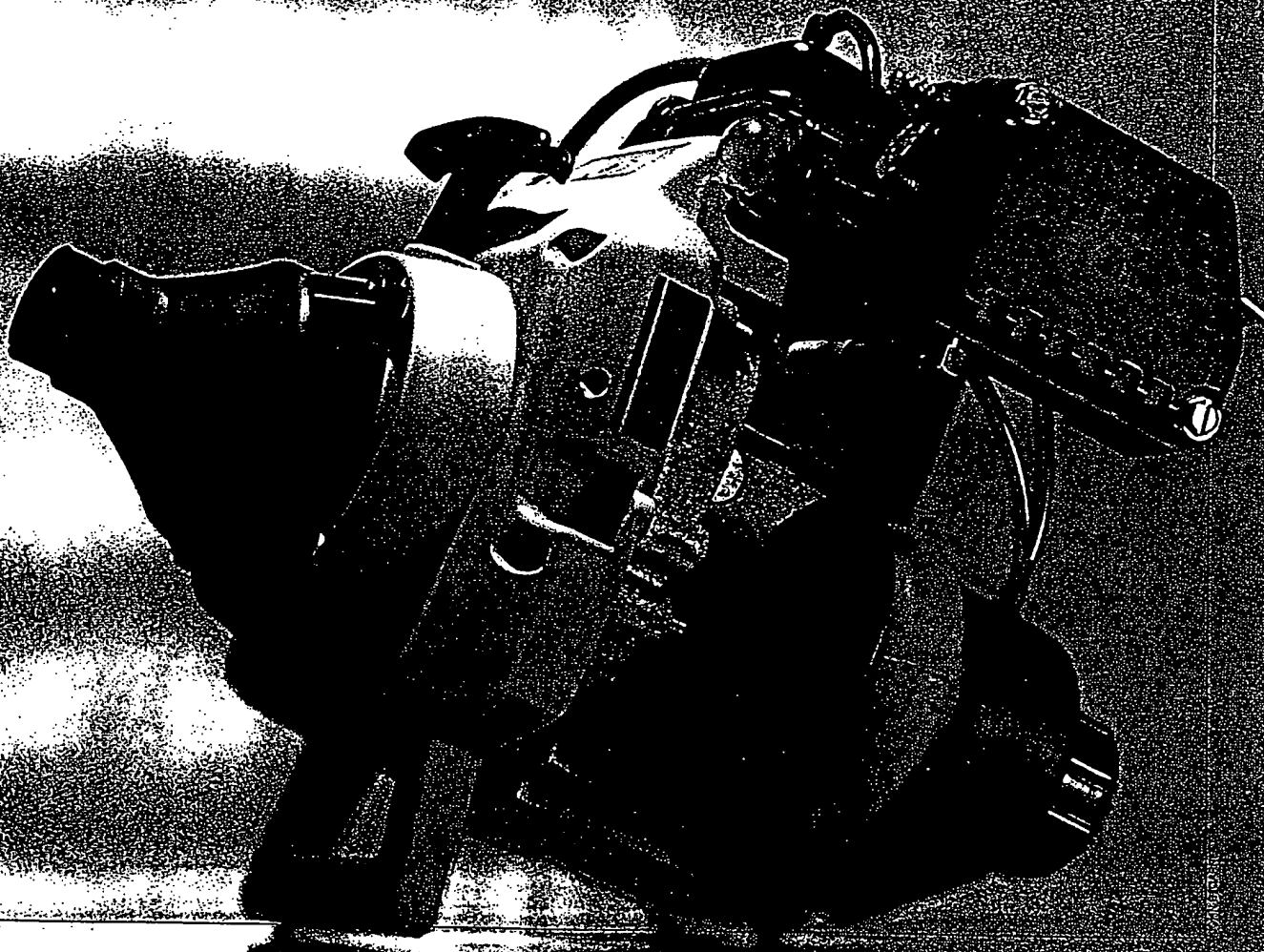


Photo by John M. Hall for ENR

✱

✱

✱

✱

✱

✱

✱

✱

✱

✱

✱

✱

✱

✱





## The little engine that could

(Continued from page 92)

splash-type system used in small four-cycles—which Ryobi claims will be effective even with the engine running inverted. By itself, it would seem unlikely that the dipper system could possibly live up to that assertion. That is, until you learn that both ends of the connecting rod ride on caged roller bearings (rather than conventional insert shells), which get along fine on very small amounts of oil. As a side benefit, the weight, cost, and power

drain of an oil-circulating pump have been eliminated.

The caged roller bearings are fitted into a steel connecting rod that is built up from two separate stampings, rather than the usual casting or forging. The stamped parts are left and right sections; there is no separate bearing cap at the bottom end. This construction technique requires that the crankshaft be pressed together from individual pieces for ease of as-

sembly, and here again Ryobi breaks from tradition by using a stamped counterweight section mated to a simple steel output shaft. Additionally, overall engine weight is kept low by the crankshaft's cantilevered design; the engine is supported in ball bearings only on the flywheel side, ending abruptly at the connecting rod.

The enlightened engineering doesn't end there, either. To eliminate a heavy iron cylinder sleeve, the CleanAir engine is built with a long-lasting, flash-chromed aluminum cylinder bore. The valve train operates from one cam lobe, using an ingenious follower mechanism that simultaneously converts the cam's rotation to the required reciprocating motion and also turns the action 90 degrees to line up with the ball-pivot rocker arms.

In addition to exhaust emissions, Ryobi addressed another form of pollution: noise. While the CleanAir engine's noise level is only a few decibels less than most engines, the biggest difference is its deeper pitch. "The improvement is the quality of the sound," says McLay. "High-pitched sounds and lower-pitched sounds at the same decibel level are two different experiences to the human ear."

Computer-aided-design technology played a major role in this process. "We incorporated a large-volume muffler, but what's more, we used computer-aided design to create noise-canceling baffling," he says. To reduce the noise generated by the gear drive, engineers designed gear profiles that would operate more quietly and then manufactured the gears in a powdered-metal material that provides some advantage in sound damping.

Now engineers are ironing out the last details, including smoothing the engine's vibrations. "We're still fine-tuning that," says McLay. "Four-cycle engines tend to vibrate more than two-cycles because they fire every other stroke."

### A 1994 debut

The CleanAir engine will be manufactured almost entirely in Arizona and will first appear in a hand-held grass trimmer at the industry's exposition this summer in Louisville, Ky. Consumers can expect to see that product on store shelves in the first part of 1994. Meanwhile, McLay says Ryobi will consider applying the technology to other outdoor power tool products, such as brush cutters, cultivators, and leaf blowers, as well as licensing the engine to manufacturers of water pumps, mowers, and high-power washers.

# RYOBI®

Making Innovative Concepts A Reality™

Ryobi America Corp.  
P.O. Box 1207  
Anderson, SC 29622-1207  
803-226-6511

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**